Catherine J. Pachuk, Ph.D.

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Profile

Senior pharma/biotech executive seeking CSO or other senior management position in biotech or senior/executive director level in pharma.

- Over 15 years experience in biotech and pharma
- Broad experience in biologics and large molecule drug development including preclinical evaluation/discovery and product development (vaccines, siRNA, ASO) for virology, metabolic and oncology indications.
- Advanced multiple product candidates into clinical development
- Managed internal programs, external collaborations and CROs
- Initiated and participated in developing business partnerships
- Experienced in representing company externally to investors and internally to Board of Directors/Scientific/Clinical Advisory Boards
- Participated in developing regulatory documents, including working with regulatory agencies including CBER and RAC
- Worked closely with patent counsel to strategize intellectual property portfolio

Professional Experience

Pfizer
620 Memorial Drive
Cambridge, MA

Sr. Director- Biology/Delivery Biology	**April 2009-present**
Sr. Director – Delivery Biology	**September 2008-April 2009**
Consultant- Delivery Biology	**July 2008-September 2008**

Research and Development:

- Responsible for directing Pfizer's Nucleic-Acid Based Therapeutic Biology program including RNAi and ASO programs.
  - Responsible for supervising a group of 33 full time colleagues and several contractors and part-time employees.
  - Responsible for developing and managing budget for the group
  - Managing collaborations and CROs
- Responsible for directing all preclinical research/development including molecular and cellular biology, nucleic acid delivery formulations, screening, cell culture and animal model development and safety and pharmacology.
- Consultant for Pfizer UK-based Virology programs including HCV program.

Preclinical *in vivo* proof of concept and safety

- Built up and directed *in vivo* animal study groups and established off-site vivarium
- Animal models development for SPoC
  - Hepatocellular Carcinoma
  - Multiple Myeloma (through collaboration)
  - Metabolic Disease Models
- *In vivo* study design and analysis (including ED_{50} determination)
- Oversight and design of PoM and PoC experiments performed within vivarium, other Pfizer units and CROs
- Assess and evaluate molecular targets *in vivo*
- Evaluation of siRNA/ASO delivery and biodistribution *in vivo* in relevant animal models (rodents, cynomolgus monkeys)
- PK/PD in normal and animal disease models (rodent, primates)
- Collaborated with Pfizer Colleagues in Drug Safety Group to conduct safety and tolerability studies.
- Nucleic acid delivery programs
  - Responsible for the development of multiple strategies for delivery and the development of *in vivo* evaluation models
- Collaborated with academic researchers in the areas of multiple myeloma and ocular melanoma/access to animal models
- Animal model development and collaborations for metabolic diseases including Type 2 diabetes and Cholesteremia.
  - Lipidemia PoC in-house studies in transgenic mice and cynomolgus monkeys
  - Type 2 Diabetes PoC studies done in collaboration with the Pfizer Diabetes group in Groton.
- Coordinated with statisticians on the design of animal studies and data analysis.

***In vitro* analysis and PoM**

- Target ID and validation
- PoM for siRNA and ASO
- *In vitro* high throughput screens
- Assay development
- Development of 2D and 3D and mixed tissue culture systems to evaluate toxicity and delivery *in vitro*.

Therapeutic Program Development (Advanced)

- Hepatocellular carcinoma (HCC)
- Diabetes
- Hypercholesteremia / Lipidemia
- COPD-small molecule program in collaboration with colleagues in the UK unit

Therapeutic Program Development (Early)

- Multiple myeloma
- Muscular Dystrophy

Biomarker Identification and Validation

- Oversaw collaboration with Scripps Institute for developing circulating exovesicle platform for biomarker identification. Specifically, exovesicle-associated small RNA profiling to ID biomarkers associated with certain diseases including HCC and Type 2 diabetes.
- Directed internal program on exovesicle small RNA platform for biomarker ID and potential use as a nucleic-acid delivery platform.
- Worked with Target Generation Unit to ID potential biomarkers to help stratify HCC patients.

- o Biomarker ID and validation for pre-clinical PoC and PoM studies.
- o Biomarker ID for potential use in clinical studies.

Nucleonics, Inc. **Co-founded January 2001**
702 Electronic Drive
Horsham, PA 19422

Vice President Preclinical Research **April 2004- April 2008**

Research:

- Directed therapeutic development efforts for HBV, HCV, Influenza, Prostate Cancer and Ovarian Cancer Programs. The lead product, an HBV shRNA-based therapeutic was advanced to Phase 1 clinical studies; first in class and first in man.
- Responsible for directing all preclinical research including molecular and cellular biology, nucleic acid delivery, chemistry and formulations, screening, cell culture and animal model development and safety and pharmacology.
- Directed the heads of Molecular and Cellular Biology, Chemistry, Safety and Toxicology and Quantitative Analysis Groups.
- Development of novel *in vitro* and *in vivo* assays to characterize product activity and safety. Assays included those to evaluate innate immune responses, interferon and pro-inflammatory cytokine responses, RISC-saturation, quantitation of shRNA expression, and fusion mRNA assays for *in vitro* and *in vivo* efficacy studies.
- Responsible for coordination and oversight of PK/PD and safety studies with CROs
- Responsible for assembling and managing the company's Scientific Advisory Boards.
- Responsible for presenting research updates to the company's Scientific Advisory Board.
- Participation and presentation at scientific meetings and workshops.
- Primary contact and scientific liaison for research collaborations with academic and industrial institutions.

Regulatory and Clinical Development:

- Identified and worked closely with regulatory and clinical consultants for preparation of FDA submissions.
- Responsible for writing IND study reports as well as other preclinical and clinical sections of IND, IB etc. Directly involved in FDA meetings and phone calls including Pre-IND and IND meetings.
- Involved in clinical development of product including clinical protocol design.
- Involved in writing sections of the Investigator's Brochure.
- Responsible for assembling the Clinical Advisory Board and identifying the PI and several other investigators for the Phase 1 Hepatitis B clinical trial.
- Involved in obtaining IRB and IBC approvals including attending site meetings and providing answers to questions from these committees.
- A primary participant in the RAC meeting and review. Responsible for supplying pre- and post RAC-meeting documents to the RAC.
- Involved in the selection of DSMB members and participated in communications and meetings with this group.
- Participated in Clinical Advisory Board and DSMB meetings.

Business Development:

- Involved in Company Financing including preparation and presentation of Roadshow presentations and preparation of materials and presentations for due diligence.
- Responsible for preparation and presentation of partnering materials.
- Participation in Board of Directors' meetings.
- Involved in in-licensing efforts and negotiations for key patents

- Initiated and participated in partnering discussions

Intellectual Property:
- Involved in writing sections and examples for all patents on which I have been named inventor.
- Worked closely with in-house IP attorney and outside counsel in the drafting of claims and answering office actions.
- Involved in developing IP strategy, including involvement in decision making processes regarding filing strategies for various patents.
- Participated in interviews with patent examiner
- Involved in prior art searches.

Key Accomplishments
- IND approval for lead shRNA-based product and initiation of Phase 1 clinical trial.
- Completion of Series B financing.
- Discovery of a novel method of RNAi transport and uptake in *in vivo* systems.
- Design of multicistronic shRNA clinical plasmid expression vectors.
- Development of enhanced RNA pol III promoters and shRNA expression systems
- Development of nucleic acid delivery formulations which target nucleic acid to the liver, ovarian cancer cell, bronchial epithelial cells and prostate cancer cells.
- Development of *in vitro* and *in vivo* screens and models for gene delivery programs and shRNA efficacy.
- Development of HCV clinical shRNA plasmid drug substance.

Senior Director Biological Sciences (Nucleonics) **January 2003 –April 2004**
- Series B fundraising initiated
- In-licensing of key patents and development of in-house intellectual property
- Recruitment of key management personnel including president and CEO and VP of Finance
- Co-wrote new Business plan focused on therapeutic development
- Directed research efforts for both platform technology development and HBV therapeutic development
- Obtained UO1 Federal grant ($1.6M)

Director Biological Sciences (Nucleonics) **December 2001-December 2002**
- Founded Nucleonics
- Co-Wrote business plan
- Obtained Series A financing for Nucleonics
- Initiated licensing discussions with Wyeth for RNAi patents
- Hired personnel, identified lab and office space, set up labs
- Directed research for RNAi platform technology development

Dept. Microbiology and Immunology
Drexel School of Medicine
Philadelphia, PA

Associate Professor (Part time) **January 2003-April 2008**

- Administered grant monies from NIH and Nucleonics through sub-contracts to Drexel
- Directed grant funded research at Drexel

Thomas Jefferson University
Dept. Biochemistry and Molecular Pharmacology
Philadelphia, PA

Associate Professor **August 2000 – December, 2002**

- Research focused on DNA vaccines and RNAi
- Lecturer for graduate level courses
- Obtained grant funding
- Incubated Nucleonics

MessagePharmaceutical, Malvern, PA
Scientific Consultant **October, 2000 – 2002**

Wyeth Vaccines (Apollon)
Malvern, PA

Assistant Research Fellow **April 1997- July 2000**

Principal Research Scientist **May 1995 - March 1997**

Senior Research Scientist **March 1993-May 1995**

Research Scientist **Mar 1992 - Mar 1993**

- **Therapeutic Development and Research**

1. **HSV** - HSV team leader:
2. Coordinated research activities with other team members and scientists and was successful at keeping the program on its prescribed timeline, from conception to the clinic.
3. Involved in the development of the prototype HSV-2 gD DNA vaccine advanced to the clinic. Responsible for the development of an expression assay for this construct.
4. Developed DNA vaccine constructs expressing alternate forms of gD that are targeted to either the extracellular environment or localized to the cytosol (patent issued) and which were demonstrated to induce different types of immune responses.
5. **HIV** – HIV Team Leader
6. Supervised the HIV molecular biology efforts and coordinated the major effort in characterization of the HIV DNA vaccine constructs in terms of mRNA and protein production.
7. Involved in preclinical efforts needed for IND submission of HIV vaccines
8. **Alternative Viral Targets** - Team leader for the alternative viral target program
9. Responsible for preclinical efforts for HBV, HCV, HPV and Dengue targets.

10. Responsible for the creation, characterization and maintenance of HSV and Dengue viral stocks.
11. Responsible for the recombinant vaccinia and adenovirus support efforts.
12. **Vector technology**- Team leader for the Vector technology Team. Involved in the development of clinical vectors including monocistronic and bicistronic vectors, development and evaluation of chimeric promoters, investigation of cytoplasmic transcription systems and the discovery of dsRNA mediated silencing *in vivo* of certain DNA vaccine constructs.

13. Gene Delivery

14. Directed research efforts for tissue culture screening of DNA targeting agents developed by our chemistry department.
15. Developed methods to characterize the interactions between bupivacaine (a facilitating agent present in our vaccines) and DNA. The work was used to develop a non-infringement position against an opposing patent (Naked DNA, Vical Inc.). Publication.

16. Ribozyme technology

17. Developed the use of non-contiguous targeting sequences that enable ribozymes to cleave RNA at sequences inaccessible (due to secondary structure) to classically designed ribozymes (patent issued, publication).
18. Developed ribozymes specific for CML associated chimeric mRNAs.

19. Antisense technology

20. Designed oligonucleotides inhibitory for the conversion of HBV pregenomic RNA into DNA (patent).
21. Analysis of mechanism of inhibition by antisense HBV oligonucleotides.

22. Analytical Method Development

1. Involved in the development of the "DNA Integration Assay" that identifies a DNA integrants in an animal model at a sensitivity of 1 integrant per $2x10^6$ genome equivalents (patent pending). This assay was the first integration assay accepted by FDA as sensitive enough to enable IND submissions for DNA vaccines.
2. Development and characterization of several integrated cell lines for use as a control in the Integration Assay.
3. Preliminary developmental work on an assay to characterize the various species of circular plasmid DNA (average number of nicks/plasmid), in a plasmid preparation.

4. Methods Development

1. Development of a novel site and sequence DNA cloning methodology that makes it possible to specifically clone multiple DNA fragments in one step (Chain Reaction Cloning patent allowed and publication).
2. Methods development, assay transfer and troubleshooting for QC. Assays included potency assays, supercoiled DNA assay.

- **Regulatory**

1. **IND Submissions** - Wrote reports that were submitted to the FDA as part of IND submissions for the company's HIV, HSV and HBV DNA vaccines.
2. **Points to Consider**- Worked with FDA in the Development of "Points to Consider" for DNA based products.

26. Intellectual Property

1. **Patent Filing-**worked with in-house and external patent counsel to write examples, patent specifications and drafting of claims.
2. **Prior art analysis-** involved in surveillance of patents and publications for prior art identification.

6. Key Accomplishments:

- First in the Clinic with a DNA product.
- Development of the first integration assay accepted by FDA to enable DNA products.

- Discovery of dsRNA-mediated gene silencing *in vivo* that was basis of patent filed in early 1999 that became basis for founding Nucleonics.

EDUCATION

Dec. 1988	University of Pennsylvania Philadelphia, PA Ph.D (Graduate Group in Molecular Biology) Mentor - Dr. Susan Weiss Molecular Virology (Coronaviruses)
May, 1982	Marywood College Scranton, PA B.S. (Biology)
Jan 1989 –March 1992	Postdoctoral Scientist SmithKline Beecham Dept. Of Gene Expression Sciences King of Prussia, PA

GRANTS

University start-up support

Scott Charitable Foundation: for DNA Vaccines, Co-PI with Dr. Stephen Boyle of Virginia Tech ($18,000)

Nanotechnology Center of Ben Franklin Technology Partners- Delivery of Nucleic Acids ($60,000 x 2yrs)

Grant 1 UO1 AI053988-01A1 – RNAi Mediated Suppression of Hepatitis B Replication (NIH): PI on grant ($1,600,000 award for Nucleonics and sub-contracts to Scripps Institute and Thomas Jefferson University).

PUBLICATIONS

Pachuk, C. J., Bredenbeek, P.J., Zoltick, P.W., Spaan, W.J.M. and Weiss, S.R. Molecular cloning of the gene encoding the putative polymerase of the mouse hepatitis coronavirus,strain A59. Virology 171 :141-148, 1989.

Bredenbeek, P.J., Pachuk, C.J., Noten, A.F.H., Charite, J., Luytjes, W., Weiss, S.R. and Spaan, W.J.M.: The primary structure and expression of the second open reading frame of the polymerase gene of the coronavirus MHV-A59; a highly conserved polymerase is expressed by an efficient ribosomal frameshifting mechanism. Nucleic Acids Res. 18 : 1825 - 1832, 1990.

Zoltick, P.W., Leibowitz, J.L., DeVries, J., Pachuk, C.J. and Weiss, S.R.: Detection of mouse hepatitis virus nonstructural proteins using antisera directed against bacterial viral fusion proteins. In : Coronaviruses and Their Diseases, Advances in Experimental Medicine and Biology, Vol.276. Plenum Press, pp. 291-300,1991.

Dennison, M.R., Zoltick, P.W., Leibowitz, J.L., Pachuk, C.J. and Weiss, S.R.: Identification of polypeptides in open reading frame 1b of the putative polymerase gene of murine coronavirus mouse hepatitis virus A59. J. Virology. 65: 3076-3082, 1991.

Pachuk, C.J., Yoon, K., Moelling, K. and Coney L.R.: Selective cleavage of bcr-abl chimeric RNAs by a ribozyme targeted to non-contiguous sequences. Nucleic Acids Res., 22 : 301-307, 1994.

Coney, L., Wang ,B., Ugen,K.E., Boyer J., McCallus D., Srikantan,V., Agadjanyan, M., Pachuk,C.J., Herold,K. and Merva,M. et al.: Facilitated DNA inoculation induces anti-HIV-1 immunity *in vivo*. Vaccine, 12: 1545-1550, 1994.

Pachuk, C.J., Wakita, T., Wang, B., Boyer, J., McCallus D., Tokushige, K., Moradpour, D., Wands, J.R., Weiner, D.B. and Coney, L.R.: HCV-core DNA vaccine constructs induce an anti-HCV core immune response. In : Vaccines 95,Molecular Approaches to the Control of Infectious Diseases. Cold Spring Harbor Laboratory Press,pp. 123-127, 1995.

Tokushige, K., Wakita, T., Pachuk, C.J., Moradpour, D., Weiner, D.B., Zurawski, V.R. Jr. and Wands, J.R.: Expression and immune response to hepatitis C virus core DNA-based vaccine constructs. Hepatology, 24:14-20, 1996.

Pachuk,C.J., Arnold,R., Herold, K., Ciccarelli, R.B. and Higgins, T.J.: Humoral and cellular immune responses to herpes simplex virus-2 glycoprotein D generated by facilitated DNA immunization of mice. Current Topics in Microbiology and Immunology, 226:79-89, 1998.

Ciccarelli, R.B., Pachuk, C.J., Samuel, M., Winter, L.A. and Satishchandran, C.: Preclinical safety of DNA vaccines: a method to analyze the distribution of plasmid DNA in animal models. In: Methods in Molecular Medicine,vol.29, DNA Vaccines: Methods and Protocols, Editors: Lowrie and Whalen, Humana Press, Totowa, NJ. 1999.

Sin, J., Kim, J.J., Arnold R.L., Shroff, K.E., McCallus, D., Pachuk, C.J., McElhiney, S.P., Wolf, M.W., Pompa-de Bruin, S.J., Higgins, T.J., Ciccarelli, R.B. and Weiner D.B. : Interleukin-12 Gene as a DNA Vaccine Adjuvant in a Herpes Mouse Model: IL-12 enhances Th1 Type CD4+ T Cell Mediated Protective Immunity against HSV-2 Challenge. J. Immunology, 162: 2912-2921, 1999.

Pachuk,C.J., Ciccarelli, R.B., Bayer, M., Samuel, M., Zurawski, D., Troutman, R., Schauer, J., Sosnoski, D.M. and C. Satishchandran: Characterization of a new class of DNA delivery complexes formed by the local anesthetic, bupivacaine. Biochem. Biophys. Acta., 1468: 20-30, 2000.

Pachuk, C.J., Zurawski, J., Samuel, M., Snyder, L. and Satishchandran, C.: Chain reaction cloning: a one-step method for directional ligation of multiple DNA fragments. GENE, 243/1-2: 19-25, 2000.

McCallus, D., Pachuk, C.J., Lee, S. and Satishchandran, C.: Current thoughts in DNA vaccines: delivery, safety and potential mechanisms of immune induction. In: New Vaccine Technologies, pp 240-262. Editor: Ron Ellis, Landes Biosciences, Georgetown, TX. 2001.

Pachuk, C.J., McCallus, D. Weiner, D.B. and Satishchandran C.: DNA Vaccines – Challenges in Delivery. Current Opinion in Molecular Therapeutics, 2: 188-198, 2000

Shroff, K.E., Borges, L.A., de Bruin, S.J., Winter, L.A., Tiberio, L., Pachuk,C., Snyder, L.A., Ciccarelli, R.B. and Higgins, T.J.: Induction of HSV-gD2 specific CD4+ cells in Peyer's patches and mucosal antibody responses in mice following DNA immunization by both parenteral and mucosal administration. Vaccine, 18: 222-230, 1999.

Sin, J.I., Bagarazzi, M., Pachuk, C., and Weiner D.B.: DNA priming-protein boosting enhances both antigen-specific antibody and Th1-type cellular immune responses in a murine herpes simplex virus-2 gD vaccine model. DNA Cell Biol, 10: 771-779, 1999.

Higgins, T.J., Herold, K.M., Arnold, R., McElhiney S., and Pachuk, C.J.: Plasmid DNA expressed secreted and non-secreted forms of HSV-gD2 induce different Types of Immune Responses. Journal of Infectious Diseases, 182: 1311-1320, 2000.

Strasser, J.E., Arnold, R.L., Pachuk, C.J., Higgins, T.J. and Bernstein D.I.: Herpes Simplex Virus DNA vaccine efficacy: effect of Glycoprotein D plasmid constructs. Journal of Infectious Disease, 182: 1304-1310, 2000.

Sin, J. I., Kim, J., Pachuk, C.J. and Weiner D.B.: IL-7 can enhance Ag-specific CTL and/or Th2 type immune responses *in vivo*. Clinical and Diagnostic Laboratory Immunology. 7: 751-758, 2000.

Sin, J.I., Kim, J., Dang, K. Pachuk, C.J., Satishchandran, C. and Weiner, D.B.: LFA-3 plasmid DNA enhances Ag-specific humoral and cellular mediated protective immunity against herpes simplex virus-2 *in vivo*: Involvement of CD4+ T cells in protection. Cellular Immunology. 203: 19-28, 2000.

Sin, J.I., Kim, J.J., Pachuk C., Satishchandran, C. and Weiner, D.B.: DNA vaccines encoding Interleukin-8 and RANTES enhance antigen-specific Th1-type CD4(+) T-cell-mediated protective immunity against Herpes Simplex Virus Type 2 *in vivo*. J. Virology, 74: 11173-11180, 2000.

Chopra, M., Pachuk, C.J., Satishchandran, C. and Giordano, T. Using RNA interference to modulate gene expression. Targets. 1: 102-108, 2002.

Manoj Samuel, Mequing Lu, Pachuk, C.J. and C. Satishchandran: A Spectrophotometeric Method to Quantify Linear DNA. Analytical Biochemistry. 313: 301-306, 2003.

Norton, P.A. and Pachuk, C.J.: New Comprehensive Biochemistry, v. 38, Methods for DNA introduction into mammalian cells. In "Gene Transfer and Expression in Mammalian Cells", S.C. Makrides, ed., Elsevier Science 2003.

Romano, P.R., McCallus, D.E., and Pachuk, C.J.: RNA interference-mediated prevention and therapy for hepatocellular carcinoma. Oncogene, 27:3857-3865, 2006.

Snyder, L.L., Esser, J.M., Pachuk, C.J. and Steel, L.F: Vector Design for liver-specific expression of multiple interfering RNAs that target hepatitis B virus transcription. Antiviral Research, 80: 36-44, 2008.

Pachuk, C.J., Wong, D.H. and C. Satishchandran: Challenges and Progress in the RNAi Therapeutic Development Arena. International Drug Discovery, April/May 2010: 10-13, 2010.

Gish, R.G., C. Satishchandran, Young, M. and Pachuk, C. RNA Interference and its Potential Application to Chronic Hepatitis B Treatment: Results of a Phase 1 Safety and Tolerability Study. Submitted.

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REPRESENTATIVE PATENTS and STATUS as of 2008

Compounds and Methods for the Treatment of Leukemias - Coney, Oakes and Pachuk - PCT National Phase Entry: US, Japan,Canada, EPO.
US- Issue Fee Paid, issued.

Anti-HBV Oligonucleotides (DR-2) - Pachuk, Yoon and Coney - U.S., Notice of Appeal, 10/11/96; Appeal brief filed, PCT: Nat'l Phase in CA, JP, EPO.

Hepatitis C Virus Vaccine - Pachuk, Coney, Zurawski, Wands and Wakita- U.S. Pending, Joint ownership Apollon/MGH **Issued.**

Hepatitis Virus Vaccines - Pachuk, Coney, Zurawski, Wands and Wakita - Enter Nat'l phase: EPO,JP,KR, AU, CA, HU, NZ, RU, Joint ownership Apollon/MGH, Pending

Method of Detecting Foreign DNA Integrated in Eukaryotic Chromosomes - Satishchandran, Ciccarelli and Pachuk - **U.S. – Issued.**

Chain Reaction Cloning - Satishchandran, Samuel, and Pachuk –
Issued, PCT, Nat'l phase. AU,CA,EPO

HSV Vaccines; Modifications of Constructs – Pachuk and Herold
US – DNA Vaccines for Herpes Simplex Virus – Pachuk and Herold.
Issued,US Continuation Pending.

Vesicular Complexes and Methods of Making the Same; Ciccarelli, Saishchandran, Pachuk, and Troutman; Nat'l phase, **Issued.**

Methods and Compositions for Inhibiting the Function of Polynucleotide Sequences; Pachuk and Satischandran; US Provisional filed, 4/21/99. Patent filed, 4/2000.

Methods and Compositions for Preventing the Formation of Aberrant RNA During Transcription of Plasmid Sequences; Satishchandran and Pachuk; US Provisional Filed, 7/9/99. Patent filed 7/2000.

The Use of Post-transcriptional Gene Silencing for Identifying Nucleic Acid Sequences that Modulate the Function of a Cell. Provisional filings, 1/31/01 and 10/26/01. PCT, 1/31/02. Pachuk, Satishchandran and Giordano.

Methods for Silencing Genes Without Inducing Toxicity. Provisional Filing, 4/26/02. Pachuk.

Use of Double Stranded RNA for Identifying Nucleic Acid Sequences that Modulate the Function of a Cell. Provisional Filing, 7/31/02. Satishchandran, Pachuk, Shuey and Chopra.

Double Stranded RNA molecules for Gene Silencing and Uses Thereof. Provisional filing, 10/18/02. Satishchandran, Pachuk and McCallus.

Transfection Kinetics and Structural Promoters. Provisional Filing, 10/22/01/ PCT filing, 10/22/02. Pachuk and Satishchandran. **US Issue fee paid. Claims allowed.**

Methods and Construction for Evaluation of RNAi Targets and Effector Molecules. Provisional filing, 2/27/03. Pachuk

WO 2005/014806;
WO 2006/069064
Title: Conserved HBV and HCV Sequences Useful for Gene Silencing
Inventors: C. Pachuk; C. Satishchandran; V. Zurawski Jr.; L. Mintz

WO 2005/040388
Title: Multiple-Compartment Eukaryotic Expression Systems
Inventors: C. Pachuk; C. Satishchandran

WO 2006/033756
Title: Multiple RNA Polymerase III Promoter Expression Constructs
Inventors: C. Pachuk; D. McCallus; C. Satishchandran; M. Sigg

WO 06/036872
Title: Targeting Opposite Strand Replication Intermediates of Single-Stranded Viruses by RNAi
Inventors: D. McCallus; B. Gu; C. Pachuk

USSN 11/935,925; PCT/US2007/83805
Title: *In Vivo* Delivery of Double Stranded RNA to a Target Cell
Inventor: C. Pachuk

PCT/US2007/81103
Title: MicroRNA-Formatted Multitarget Interfering RNA Vector Constructs and Methods of Using the Same
Inventors: L. Steel, C. Pachuk